

## CLAIMS

1. A magnetic resonance imaging system comprising:  
means which generates a static magnetic field;  
5 gradient magnetic field generating means which generates  
a gradient magnetic field;  
RF magnetic field generating means which generates an  
RF magnetic field;  
measuring means which measures a magnetic resonance  
10 signal generated from a target;  
computing means which performs a computation on the  
magnetic resonance signal;  
memory means which stores the magnetic resonance signal  
and the result of computation by the computing means; and  
15 sequence control means which sets operating conditions  
to respective portions of the gradient magnetic field generating  
means, the RF magnetic field generating means, the measuring  
means, the computing means and the memory means to control the  
operations of the respective portions,  
20 wherein the sequence control means includes control to  
irradiate the target with the RF magnetic field at least once,  
measure the magnetic resonance signal generated after the  
irradiation of the RF magnetic field in a state in which the  
strength of application of the gradient magnetic field is  
25 approximately zero, and calculate magnetic resonance spectrum

information from the measured magnetic resonance signal to thereby perform a magnetic resonance spectrum measurement, and wherein the sequence control means performs control (1) to measure a first magnetic resonance signal generated from 5 a measurement voxel at the magnetic resonance spectrum measurement at a first time interval, (2) to detect a magnetic resonant frequency F1 of water from a first magnetic resonance spectrum obtained by Fourier-transforming the first magnetic resonance signal, (3) to measure a second magnetic resonance 10 signal generated from the voxel at a second time interval subsequent to the elapse of a predetermined time from the measurement of the first magnetic resonance signal, (4) to detect a magnetic resonant frequency F2 of water from a second magnetic resonance spectrum obtained by Fourier-transforming the second 15 magnetic resonance signal, and (5) to calculate a time-varying rate of the magnetic resonant frequency of water on the basis of the F1 and F2.

2. A magnetic resonance imaging system comprising:  
20 means which generates a static magnetic field;  
gradient magnetic field generating means which generates a gradient magnetic field;  
RF magnetic field generating means which generates an RF magnetic field;  
25 measuring means which measures a magnetic resonance

signal generated from a target;

computing means which performs a computation on the magnetic resonance signal;

memory means which stores the magnetic resonance signal

5 and the result of computation by the computing means; and

sequence control means which sets operating conditions to respective portions of the gradient magnetic field generating means, the RF magnetic field generating means, the measuring means, the computing means and the memory means to control the 10 operations of the respective portions,

wherein the sequence control means includes control to irradiate the target with the RF magnetic field at least once, measure the magnetic resonance signal generated after the irradiation of the RF magnetic field in a state in which the 15 strength of application of the gradient magnetic field is approximately zero, and calculate magnetic resonance spectrum information from the measured magnetic resonance signal to thereby perform a magnetic resonance spectrum measurement, and

wherein the sequence control means performs control (1) 20 to measure a first magnetic resonance signal generated from a measurement voxel at the magnetic resonance spectrum measurement at a first time interval, (2) to detect a magnetic resonant frequency F1 of water from a first magnetic resonance spectrum obtained by Fourier-transforming the first magnetic 25 resonance signal, (3) to measure a second magnetic resonance

signal generated from the voxel at a second time interval subsequent to the elapse of a predetermined time from the measurement of the first magnetic resonance signal, (4) to detect a magnetic resonant frequency F2 of water from a second magnetic 5 resonance spectrum obtained by Fourier-transforming the second magnetic resonance signal, (5) to estimate, based on the F1 and F2, a time-varying rate of a magnetic resonant frequency of water at a measurement time at which the magnetic resonance signal is measured after the completion of measurement of the 10 second magnetic resonance signal, (6) to calculate, using the estimated time-varying rate of the magnetic resonant frequency, a transmission frequency of the RF magnetic field or/and a received frequency at which the magnetic resonance signal generated from the voxel is received and measure the magnetic 15 resonance signal generated from the voxel after the setting of the operating conditions of the RF magnetic field generating means or/and the measuring means, and (7) to perform said (6) repeatedly plural times subsequently to the completion of measurement of the second magnetic resonance signal.

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3. A magnetic resonance imaging system comprising:  
means which generates a static magnetic field;  
gradient magnetic field generating means which generates a gradient magnetic field;  
25 RF magnetic field generating means which generates an

RF magnetic field;

measuring means which measures a magnetic resonance signal generated from a target;

computing means which performs a computation on the  
5 magnetic resonance signal;

memory means which stores the magnetic resonance signal and the result of computation by the computing means; and

sequence control means which sets operating conditions to respective portions of the gradient magnetic field generating  
10 means, the RF magnetic field generating means, the measuring means, the computing means and the memory means to control the operations of the respective portions,

wherein the sequence control means includes control to irradiate the target with the RF magnetic field at least once,  
15 measure the magnetic resonance signal generated after the irradiation of the RF magnetic field in a state in which the strength of application of the gradient magnetic field is approximately zero, and calculate magnetic resonance spectrum information from the measured magnetic resonance signal to  
20 thereby perform a magnetic resonance spectrum measurement, and

wherein the sequence control means performs, when the measurement of the magnetic resonance signal is performed repeatedly plural times, control (1) to execute a pre-scan for measuring a magnetic resonant frequency of water each time the  
25 magnetic resonance signal is measured a predetermined number

of times, (2) to detect a magnetic resonant frequency of water from a magnetic resonance spectrum obtained by Fourier-transforming the magnetic resonance signal obtained by the pre-scan, and (3) to set, based on the magnetic resonant frequency detected in said (2), a transmission frequency of the RF magnetic field radiated into the target or/and a received frequency at the measurement of the magnetic resonance signal in the spectrum measurement sequence executed subsequently to the pre-scan.

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4. A magnetic resonance imaging system comprising:  
means which generates a static magnetic field;  
gradient magnetic field generating means which generates a gradient magnetic field;  
15 RF magnetic field generating means which generates an RF magnetic field;  
measuring means which measures a magnetic resonance signal generated from a target;  
computing means which performs a computation on the  
20 magnetic resonance signal;  
memory means which stores the magnetic resonance signal and the result of computation by the computing means; and  
sequence control means which sets operating conditions to respective portions of the gradient magnetic field generating  
25 means, the RF magnetic field generating means, the measuring

means, the computing means and the memory means to control the operations of the respective portions,

wherein the sequence control means performs, when the measurement of the magnetic resonance signal is performed repeatedly plural times, control (1) to execute a pre-scan for measuring a magnetic resonant frequency of water each time the magnetic resonance signal is measured a predetermined number of times, (2) to detect a magnetic resonant frequency of water from a magnetic resonance spectrum obtained by Fourier-transforming the magnetic resonance signal obtained by the pre-scan, and (3) to set, based on the magnetic resonant frequency of water detected in said (2), a transmission frequency of the RF magnetic field radiated into the target or/and a received frequency at the measurement of the magnetic resonance signal in a pulse sequence executed subsequently to the pre-scan.

5. A magnetic resonance imaging system comprising:

means which generates a static magnetic field;  
gradient magnetic field generating means which generates a gradient magnetic field;  
RF magnetic field generating means which generates an RF magnetic field;  
measuring means which measures a magnetic resonance signal generated from a target;  
computing means which performs a computation on the

magnetic resonance signal;

memory means which stores the magnetic resonance signal and the result of computation by the computing means; and sequence control means which sets operating conditions

5 to respective portions of the gradient magnetic field generating means, the RF magnetic field generating means, the measuring means, the computing means and the memory means to control the operations of the respective portions,

wherein the sequence control means performs control (1)

10 to execute a water suppression sequence for applying the RF magnetic field and the gradient magnetic field to the target to thereby suppress a signal of water, (2) to execute a spectrum measurement sequence for applying the RF magnetic field and the gradient magnetic field to the target to select and excite

15 a predetermined voxel and measuring the magnetic resonance signal generated from the predetermined voxel, (3) to execute a pre-scan sequence for measuring a magnetic resonant frequency of water prior to said (1) and (2) being executed a predetermined number of times, where said (1) and (2) are performed repeatedly

20 plural times, and (4) to, on the basis of the magnetic resonant frequency of water detected in said (3), set a transmission frequency of the RF magnetic field irradiated in the water suppression sequence and set a transmission frequency of the RF magnetic field irradiated to select and excite the

25 predetermined voxel or/and a received frequency at the detection

of the magnetic resonance signal generated from the predetermined voxel in the spectrum measurement sequence.

6. A magnetic resonance imaging system comprising:

5       means which generates a static magnetic field;  
gradient magnetic field generating means which generates a gradient magnetic field;

RF magnetic field generating means which generates an RF magnetic field;

10      measuring means which measures a magnetic resonance signal generated from a target;

computing means which performs a computation on the magnetic resonance signal;

15      memory means which stores the magnetic resonance signal and the result of computation by the computing means; and  
sequence control means which sets operating conditions to respective portions of the gradient magnetic field generating means, the RF magnetic field generating means, the measuring means, the computing means and the memory means to control the 20 operations of the respective portions,

wherein the sequence control means performs control (1) to execute a water suppression sequence for applying the RF magnetic field and the gradient magnetic field to the target to thereby suppress a signal of water, (2) to execute a spectrum 25 measurement sequence for applying the RF magnetic field and

the gradient magnetic field to the target to select and excite  
a predetermined voxel and measuring the magnetic resonance  
signal generated from the predetermined voxel, (3) to, when  
said (1) and (2) are performed repeatedly plural times, detect  
5 a water signal peak from a magnetic resonance spectrum obtained  
by Fourier-transforming the magnetic resonance signal obtained  
by the execution of said (1) and (2), each time said (1) and  
(2) are executed a predetermined number of times to calculate  
a signal strength of the water signal peak, (4) to determine  
10 that a magnetic resonant frequency of water has been shifted  
when the calculated signal strength of the water signal peak  
is increased to a predetermined value or more, (5) to execute  
a pre-scan for measuring the water magnetic resonant frequency  
when the water magnetic resonant frequency is judged to have  
15 been shifted in said (4), (6) to detect a magnetic resonant  
frequency of water from a magnetic resonance spectrum obtained  
by Fourier-transforming the magnetic resonance signal obtained  
in the pre-scan, and (7) to, in a pulse sequence executed  
subsequently to the pre-scan on the basis of the magnetic  
20 resonant frequency of water detected in said (6), set a  
transmission frequency of the RF magnetic field irradiated in  
the water suppression sequence, or/and set a transmission  
frequency of the RF magnetic field irradiated to select and  
excite the predetermined voxel in the spectrum measurement  
25 sequence, or/and set a received frequency at the detection of

the magnetic resonance signal generated from the predetermined voxel.

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